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**A SKYLAB PROGRAM FOR THE
INTERNATIONAL HYDROLOGICAL DECADE (IHD)**

Quarterly Report for Period September 1974 - November 1974

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Prepared by

Fabian C. Polcyn
Diana L. Rebel

NASA Technical Monitor

Mr. Larry York/TF
National Aeronautics and Space Administration
Johnson Space Center
Principal Investigator Management Office
Houston, Texas 77058

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A SKYLAB PROGRAM FOR THE
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Quarterly Report for Period September 1974 - November 1974

This report covers progress during the seventh quarter (1 September - 1 November 1974) of contract NAS9-13275, "A SKYLAB Program for the International Hydrological Decade (IHD)," EREP No. 427M. The principal objective of this program is the study of various hydrological aspects (soil moisture, currents, etc.) of portions of the Lake Ontario basin using SKYLAB and aircraft data. The work is being conducted in the Infrared and Optics Division of the Environmental Research Institute of Michigan, under the general supervision of Mr. R. R. Legault. The principal investigator is Mr. F. C. Polcyn.

PROGRESS

During this reporting period preprocessing and processing of the aircraft data obtained 10 and 11 September 1973 over the Elora Farm (Ontario, Canada) was completed. The 5000 foot data of 10 September was corrected for scan angle effects and a correction for path radiance (dark level subtraction) was made. A computer program was written to implement the algorithm developed previously for predicting surface soil moisture of vegetated terrain based on reflectance characteristics in the red and near IR channels. The data collected on 10 September was converted from radiance values to reflectance values based on theoretical knowledge since specific calibration sources were lacking. The model was then run over several fields using this data.

In simplified form, the algorithm used to develop this reflective model is based on the fact that as soil moisture increases IR reflectance decreases, but as vegetation cover increases IR reflectance increases. The problem, then, is to sort out these separate and opposite effects. An IR/red reflectance ratio has been found to be insensitive to type of soil or soil moisture, but very sensitive to vegetation cover.* Therefore, an IR/red ratio is used in the algorithm to account for variations in percent cover. Coefficients utilized in the model are related to the specific soil type.

*(J. Colwell, Ph.D. dissertation, 1973).

This reflective model for determination of soil moisture is not effective for conditions where the soil is obscured by vegetation. A further consideration in using the model is that it works best when the vegetation is green.

Preliminary results obtained in running the soil moisture model over the Elora Farm data indicate that it will give reasonable results. Several factors can improve the accuracy of this model. Among these are use of reflectance calibration sources, a knowledge of the soil type(s) involved and utilization of the coefficients specific to that type, and good ground truth concerning the percent green and percent brown cover. Surface soil moisture measurements in areas of differing percent covers is necessary in order to validate the accuracy of the model.

Implementation of the second model (the thermal model) for determination of surface soil moisture on non-vegetated areas based upon diurnal soil temperatures and ancillary data is continuing.

FUTURE PLANS

Plans for the next quarter include completion of the running of the thermal model for determination of surface soil moisture on non-vegetated areas.

TRAVEL

None

SPECIAL PROBLEMS

The S-192 data of 9 September 1973, pass 29 for the four channels unaffected by the calibration light has not been received as yet. Lack of this data prevents testing of soil moisture model on satellite data, thus affecting completion of work as proposed. Furthermore, the upcoming move of ERIM to new facilities in April will result in a temporary cessation of computer processing. Consequently, receipt of the S-192 data before the end of February is imperative if the contract technical work end date of 30 June is to be maintained.

SIGNIFICANT RESULTS

Demonstration of the procedure for utilizing the model relating red and IR reflectance to surface soil moisture over regions of variable vegetation cover indicates that remote sensing may be able to make direct inputs into determination of this important hydrologic parameter.

PUBLICATIONS

None

Respectfully submitted:

Fabian C. Polcyn

Fabian C. Polcyn
Principal Investigator

Approved by:

Paul Rice for
Richard R. Legault
Director - Infrared and Optics
Division

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